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PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C. 20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 15 May 2000 (15.05.00)	
International application No. PCT/GB99/03072	Applicant's or agent's file reference P2859PCT
International filing date (day/month/year) 15 September 1999 (15.09.99)	Priority date (day/month/year) 16 September 1998 (16.09.98)
Applicant KILNER, Ian	

1. The designated Office is hereby notified of its election made:



in the demand filed with the International Preliminary Examining Authority on:

11 April 2000 (11.04.00)



in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was



was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Pascal Piriou Telephone No.: (41-22) 338.83.38
--	--

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

To:

ROYSTONS
Tower Building
Water Street
Liverpool L3 1BA
ROYAUME-UNI

Date of mailing (day/month/year) 11 April 2000 (11.04.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference P2859PCT	
International application No. PCT/GB99/03072	International filing date (day/month/year) 15 September 1999 (15.09.99)

1. The following indications appeared on record concerning: <input type="checkbox"/> the applicant <input type="checkbox"/> the inventor <input checked="" type="checkbox"/> the agent <input type="checkbox"/> the common representative		
Name and Address THOMSON, Paul Potts, Kerr & Co. 15 Hamilton Square Birkenhead Merseyside CH41 6BR United Kingdom	State of Nationality	State of Residence
	Telephone No. 0151 647 6746	
	Facsimile No. 0151 647 6158	
	Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning: <input checked="" type="checkbox"/> the person <input type="checkbox"/> the name <input checked="" type="checkbox"/> the address <input type="checkbox"/> the nationality <input type="checkbox"/> the residence		
Name and Address ROYSTONS Tower Building Water Street Liverpool L3 1BA United Kingdom	State of Nationality	State of Residence
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
3. Further observations, if necessary:		
4. A copy of this notification has been sent to: <input checked="" type="checkbox"/> the receiving Office <input checked="" type="checkbox"/> the designated Offices concerned <input type="checkbox"/> the International Searching Authority <input type="checkbox"/> the elected Offices concerned <input type="checkbox"/> the International Preliminary Examining Authority <input checked="" type="checkbox"/> other: Former Agent THOMSON, Paul		

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Mougamadou ABIDINE Telephone No.: (41-22) 338.83.38
---	--

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P2859PCT	FOR FURTHER ACTION <small>see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.</small>	
International application No. PCT/GB 99/ 03072	International filing date (day/month/year) 15/09/1999	(Earliest) Priority Date (day/month/year) 16/09/1998
Applicant PROTOL POWDER COATINGS LIMITED et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II).

4. With regard to the title,

☐ the text is approved as submitted by the applicant.

☒ the text has been established by this Authority to read as follows:

A PROCESS FOR RECYCLING POWDER COATING FINES

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.:

☐ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

☒ None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/03072

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 C08J11/00 //C09D5/03

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C08J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 683 199 A (FINA RESEARCH S.A.) 22 November 1995 (1995-11-22) entire document	1-16
X	DE 197 03 376 C (BASF LACKE + FARBEN AG) 12 March 1998 (1998-03-12) claims 1-4,9,10,12	1-8

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
 "E" earlier document but published on or after the international filing date
 "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
 "O" document referring to an oral disclosure, use, exhibition or other means
 "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
 "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
 "&" document member of the same patent family

Date of the actual completion of the international search

3 December 1999

Date of mailing of the international search report

17/12/1999

Name and mailing address of the ISA
 European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax (+31-70) 340-3018

Authorized officer

Hallemeesch, A

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 99/03072

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 683199	A	22-11-1995	CZ 9501034 A	17-04-1996
			FI 951855 A	23-10-1995
			HU 71821 A, B	28-02-1996
			NO 951496 A	23-10-1995
DE 19703376	C	12-03-1998	WO 9833848 A	06-08-1998

PATENT COOPERATION TREATY

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

WRITTEN OPINION

② (PCT Rule 66)

To:

ROYSTONS
Tower Building
Water Street
Liverpool, Merseyside L3 1BA
GRANDE BRETAGNE

FILE No P4536	TECHNICAL A1L	
DEADLINE 22.9.2000		
COMPUTER	ENTERED DLM	CHECKED RC

Date of mailing
(day/month/year)

22.06.2000

Applicant's or agent's file reference

AJL/IR/P4536

REPLY DUE

within 3 month(s)
from the above date of mailing

International application No.

PCT/GB99/03072

International filing date (day/month/year)

15/09/1999

Priority date (day/month/year)

16/09/1998

International Patent Classification (IPC) or both national classification and IPC

C08J11/00

Applicant

PROTOL POWDER COATINGS LIMITED et al.

1. This written opinion is the first drawn up by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain document cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

3. The applicant is hereby invited to reply to this opinion.

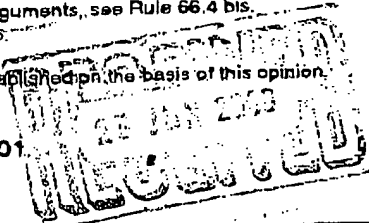
When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also: For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.
For an informal communication with the examiner, see Rule 66.5.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 16/01/2001



Name and mailing address of the international preliminary examining authority:



European Patent Office - P.B. 5016 Patentlaan 2
NL-2280 HV Rijswijk - Pays Bas
Tel. +31 70 340 - 2040 Tx: 31 651 epo nl
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Authorized officer / Examiner

Hallemeesch, A

Formalities officer (incl. extension of time limits)

Smits, A

Telephone No. +31 70 340 3596



WRITTEN OPINION

International application No. PCT/GB99/03072

VIII. Certain observations on the International application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

**WRITTEN OPINION
SEPARATE SHEET**

International application No. PCT/GB99/03072

1). State of the art

Reference is made to the following documents :

D1 : EP-0683199 A

D2 : DE-19703376 A

D1 deals with recycling of the fines left during the preparation of powder coatings (col. 1, lines 1-16 and col. 2, lines 13-16). It discloses a process in which a layer of waste powder is formed and subjected to heat up to coalescence of the powder but below decomposition or crosslinking (claim 1). It also discloses an apparatus for the treatment of the waste powder coating (claim 7). An even layer of waste powder is deposited on a conveyor belt and coalesced by heating using infrared lamps (example 1).

D2 describes a similar process for agglomerating powder coating fines, there being mentioned explicitly a heating temperature of 60°C (claims 1-4).

2). Art. 33(1)(2) PCT - Novelty

The original claim 1 has been amended by introducing the technical feature of depositing the fines on the conveyor means as a series of continuous lines. Because of this the subject-matter of claims 1-16 is considered to be novel (Art. 33(1)(2) PCT).

3). Art. 33(1) (3) PCT - Inventive step

Document D1 which is considered to represent the most relevant state of the art, discloses a related process and process plant for recycling fines, from which the subject-matter of claims 1 differs in that in the fines are deposited onto conveyor means as a series of continuous lines instead of as an even layer.

For analysing inventive step, it has to be determined whether said distinguishing feature solves a technical problem in an unexpected manner. There is no evidence on file that an unexpected technical effect in view of D1 was obtained as both specifications arrive at recycling the fines up to 100% (See D1, column 3, lines 35-40). The technical problem to be solved is, therefore, to provide a further recycling process for powder coating fines in view of D1. The solution to this problem is however an obvious one.

**WRITTEN OPINION
SEPARATE SHEET**

International application No. PCT/GB99/03072

It is however generally known to the person skilled in the art that the feature of depositing the fines as continuous lines according to claim 1, is an equivalent to the feature of depositing fines as an even layer as disclosed in D1 and can be interchanged with that feature where circumstances make it desirable. This merely needs adapting the exit point of the fines feed hopper and every skilled person knows how to handle this.

Consequently, the application does not appear to be based on an inventive step, and, therefore, the provisions of Art. 33(1)(3) PCT are not met.

3). Art. 6 PCT - The claims

Claim 13 has no basis in the description.

Claim 17 defines the heating means by a result to be achieved (PCT Guidelines C-III, 4.7).

The term "patent" on page 11 should be replaced by a more appropriate term.

Royston

established 1865

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532 Rec'd PCT/PTO 16 MAR 2001

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European Patent Office,
Branch at the Hague,
P.B. 5818 Patentlaan, 2,
2280 HV RIJSWIJK (ZH),
The Netherlands.

Our Ref. AJL/IR/P4536
Your Ref.
Date 15 September 2000

Dear Sirs,

PCT Patent Application No. PCT/GB99/03072
A recycling process
Protol Powder Coatings Limited (P4536)

In response to the first Written Opinion, we enclose in triplicate amended pages 4, 5, 6, 9, 11, and 12 to 15 of the description and claims to replace the corresponding pages on file at present.

Claim 1 has been further amended to make it clear that each line of fines forms an agglomerated mass. Claim 17 has been deleted. Consequential amendments have been made to the remainder of the claims.

The description has been amended for conformity with the amended claims.

It is noted that the claims satisfy the novelty requirement. We submit that the claims also satisfy the inventive step requirement for the following reasons. The closest prior art is represented by EP-0683199A (D1). This document discloses a process for recycling fines in which they are deposited as an even layer on a conveyor belt and coalesced by heating using infra red lamps. It is to be noted that the fines are deposited on the conveyor belt by means of a vibrating plate (see 16 in Figures 1 and 2).

There is a practical difficulty with this approach in that as the materials being treated are fines, they will not be easily transferable onto a moving conveyor belt from a vibrating plate, because they will not necessarily remain on the belt but are likely to fall off the sides. It is by no means certain that an even layer of fines will result.

It is not feasible to modify the Fina apparatus by addition of a profiled comb or plate because of the presence of the vibrating plate.

European Patent Office,
Hague, The Netherlands.

15 September 2000

Page 2

A second practical difficulty assuming that an even layer can be produced is that the top of the layer will agglomerate but will also insulate the bottom of the layer from the heat treatment leaving untreated fines in the end product. These would have to be sieved out later and returned for further treatment.

It is extremely unlikely that 100% recycling can be achieved with the process of D1 because it does not deal with the practical difficulties of recycling fines.

By contrast the present Applicant has designed a process capable of 100% recycling of fines. By depositing the fines in continuous lines, such as by use of a profiled comb or plate, there is no dispersion problem as there is with the process of D1. Secondly the heat treatment can be effective through the profiles of the lines to avoid untreated fines in the end product.

A further advantage of the process of the invention is that the resultant lines of agglomerated material falling off the conveyor break up naturally into small agglomerated pieces without the need for a grinder at the end of the process.

Thus, the present invention provides a workable process for recycling fines that does not have the disadvantages of the prior art process described in D1 and yet is simpler because no grinding step is required.

We now look forward to receiving a favourable International Preliminary Examination Report.

Yours faithfully,

ROYSTONS.

Encs



Europäisches
Patentamt

European
Patent Office

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Einsender / Sender / Expéditeur :

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**Bestätigung über den
Eingang nachgereichter
Untedagen für Patentan-
meldungen/Patente beim
Europäischen Patentamt**

**Acknowledgement of
receipt for subsequently
filed items relating to
patent applications/patents
at the European Patent
Office**

**Accusé de réception à
l'Office européen des bre-
vets de pièces produites
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d'une demande de brevet/
à la délivrance d'un brevet
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Den Haag; Datum + B = Einreichungsort
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receipt)

La date et le lieu de réception sont indi-
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(M + date = pièces reçues à Munich; date
seule = pièces reçues à La Haye; date +
B = pièces reçues à Berlin)

Eingereichte Unterlagen

Items filed

Pièces envoyées

Anmeldungs- (und Direktions-*) Nr./Patent Nr. Application (and Directorate*) No./Patent No. N de la demande (et de la direction*)/n du brevet	Ihr Zeichen Your reference Votre référence	ggl. Art und Datum der Unterlagen** Nature and date of items (optional)** Nature et date des pièces (facultatif)**
1. PCT/GB99/03072	AJLI/R/P4536	Response to 1 st written Opinion + replacement pages 4, 5, 6, 9, 11 and 12 to 15
2.		SENT: 15.09.2000
3		
4		
5		
6		
7		
8		
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10		

* falls bereits bekannt

* If already known

* si déjà connu

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réception se rapporte à une pièce
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référence indiquée.

duration parameters were too low, no meaningful product could be produced, and if too high, the fines fused into solid block and hence, were unusable.

With reference to Table 1 below, the results of such experiments can be seen:

Duration	Temperature	% Product ¹
1 hour	70°C	58%
2 hours	70°C	83%

¹The % Product column indicates final yield of granular material once the semi-fused mass was crushed and screened through a 3.0 mm screen and then sieved on a 212 micron screen to remove any fines.

It was observed that the resulting grains were easy to handle and could be readily used as either a finished, non-colour specific, powder coating, that is, once the grains had been crushed to the correct particle size, or as a raw material for use in producing a new, colour specific, powder coating. With reference to the latter use, the resulting grains are preferably added at an addition level of around 5% to the new, colour specific, powder coating.

In light of our findings it is believed that in order to make the fines reusable and more manageable, it is essential to heat the fines to a point where they become tacky or semi-fused i.e. up to a point where the fines are not fully melted or cross-linked. If over-heated, the coating is fully cured and cannot be reused as a powder coating.

EP-0683199A discloses a process in which a layer of fines is formed on a conveyor belt and subjected to heat up to coalescence of the powder but below decomposition or cross-linking.

According to the present invention there is provided a process for recycling fines produced during the production of powder coatings comprising the steps of:

depositing the fines onto conveyor means as a series of continuous lines;

heating the lines of fines without fully melting or cross-linking them until they

become sufficiently tacky to form agglomerated masses;

cooling such agglomerated masses; and

collecting the agglomerated mass.

The invention further provides a process plant for recycling fines in accordance with a process for recycling fines the process plant including:

means for transporting the fines to be recycled as a series of continuous lines into a heating area and then into a cooling area.

It is an object of the present invention to provide a recycling process that enables the fines produced during the production of powder coatings to be reused as a powder coating.

The process of the invention preferably comprises the step of passing the fines under a profiled comb or plate to form the continuous lines. The lines preferably have triangular profiles and preferably have a depth of 0.5 to 1.0 cm.

Further preferably, the fines are heated at a temperature of 60-80°C, preferably 70°C.

Further preferably the resulting particles have a size of 3 mm to 212 microns.

Further preferably, any particles having a size of less than 212 microns are removed from the resultant product.

One example of a recycling process will now be described with reference to a production trial that was carried out by us, and which is described herein below:

Production Trial

Several tons of fines were processed in a steam heated tray oven. The trays were lined with Melinex (RTM), which is a high melting point plastic film that will prevent

adhesion or coating of the trays.

After a period of two hours, at a temperature of 70°C, it was observed that the mass on the trays had transformed into a crude honeycomb of product. This product was removed from the oven and allowed to cool on the trays.

The cooled mass was then removed from the trays and placed in a feed hopper to a crushing and screening plant. The particle size of the resulting grains produced was in the range of 3.00 mm to 212 microns.

The resulting grains were then reprocessed as a new raw material component in some test formulations at an inclusion rate of around 5%. The resulting test powder coatings were sprayed and baked in the normal QC process and found to be satisfactory.

Non-limiting embodiments of a processing plant in accordance with the present invention will now be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a schematic illustration of a first embodiment of a process plant in accordance with the present invention;

Figure 2 is a side elevation of the belt of the plant of Figure 1; and

Figure 3 is a schematic illustration of a second embodiment of a process plant in accordance with the present invention.

A first embodiment of a processing plant 10 in accordance with the present invention may include:

A) Fines Feed Hopper 11

The fines to be recycled were fed into a fines feed hopper 11. Preferably, the fines feed hopper 11 is designed so as to ensure that the fines

The cooled agglomerated lines of product fall off the end of the belt 14 into a container, or directly into the extruder feed hopper 18.

Unlike the batch oven produced material, which produces a large honeycomb of partially cured product, which needs to go through a crushing and screening process, the agglomerated material produced by this continuous process is directly reusable at the extruder stage of powder paint production.

A final scraper blade 19 cleans the belt 14 and the scrapings fall into the receiving container or extruder feed hopper 18.

As illustrated in Figure 3, in a processing plant suitable for carrying out the recycling process of the present invention, the continuously moving belt is replaced by a screw feed unit 14a, that is, the fines feed hopper 11 feeds the fines 15 to be recycled into a screw feed unit 14a that is driven by motor 14c.

The design of the hopper, hopper/screw feed interface and screw profile of the screw feed unit 14a are specifically designed to ensure a constant and controlled flow of fines through the system. Moreover, the materials of construction of the screw feed unit 14a ensure that part cured fines do not coat the plant interior, which facilitates cleaning of the plant.

The principle of a plant including a screw feed unit 14a is similar to the belt plant described above, in that the heating and curing energy is provided by infra-red lamps; although, it is to be understood that in certain applications ultra violet lamps may be used instead. Additionally, and although the screw feed unit replaces the belt conveying system, the heating and cooling stages work to the same principles.

curing apparatus which could achieve the partial cure profile as described herein.

CLAIMS

1. A process for recycling fines produced during the production of powder coatings comprising the steps of:
depositing the fines onto conveyor means as a series of continuous lines;
heating the lines of fines without fully melting or cross-linking them until they become sufficiently tacky to form agglomerated masses;
cooling such agglomerated masses; and
collecting the agglomerated mass.
2. A process as claimed in claim 1, comprising passing the fines under a profiled comb or plate to form the continuous lines.
3. A process as claimed in claim 1 to 2, wherein the continuous lines of fines have triangular profiles.
4. A process as claimed in claim 1, 2 or 3, wherein the lines of fines have a depth of 0.5 to 1.0 cm.
5. A process as claimed in any one of claims 1 to 4, wherein heating is by means of at least one infra red lamp.

6. A process as claimed in any one of claims 1 to 5, wherein the conveyor means is a moving belt running at a speed to give the fines an exposure time of 1 to 5 seconds.
7. A process as claimed in any one of claims 1 to 6, further comprising the step of processing the lines of agglomerated mass to produce particles of a desired particle size.
8. A process as claimed in any one of the preceding claims, wherein the fines are heated at a temperature of 60 to 80°C.
9. A process as claimed in claim 8, wherein the fines are heated at a temperature of 70°C.
10. A process as claimed in any one of the preceding claims, wherein after cooling, the cooled lines of agglomerated mass are crushed to produce particles of a desired particle size.
11. A process as claimed in claim 10, wherein the cooled lines of agglomerated mass are crushed to produce particles having a size of 3.00mm to 212 microns.

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12. A process as claimed in claim 11, wherein any crushed particles having a size of less than 212 microns are removed.

13. A process plant for recycling fines in accordance with a process for recycling fines as claimed in any one of the preceding claims, the process plant including:

means for transporting the fines to be recycled as a series of continuous lines into a heating area and then into a cooling area.

14. A process plant as claimed in claim 13 including a profiled comb or plate for forming the fines in continuous lines.

15. The process plant of claim 13 or 14, wherein the means for transporting the fines into a heating area and cooling area work continuously.

16. The process plant of claim 13, 14 or 15, wherein the means for transporting the fines into a heating area and then into a cooling area is a moving belt.

17. The process plant of any one of claims 13 to 16, wherein the heating area has heating means including at least one infra red lamp.

18. The process plant of any one of claims 13 to 16, wherein the heating area has heating means including at least one ultra violet lamp.

19. The process plant of any one of claim 13 to 18, wherein the cooling area includes means for producing a cool stream of air.

20. The process plant of any one of claims 16 to 19 further comprising scraper means for cleaning the moving belt.

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference. AJL/IR/P4536		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/GB99/03072	International filing date (day/month/year) 15/09/1999	Priority date (day/month/year) 16/09/1998
International Patent Classification (IPC) or national classification and IPC C08J11/00		
Applicant PROTOL POWDER COATINGS LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 9 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 11/04/2000	Date of completion of this report 28.11.2000
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized officer Hallemeesch, A Telephone No. +31 70 340 2431 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB99/03072

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*
Description, pages:

1-3,7,8,10	as originally filed		
4-6,9,11	as received on	15/09/2000	with letter of 15/09/2000

Claims, No.:

1-20	as received on	15/09/2000	with letter of 15/09/2000
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Drawings, sheets:

1/2,2/2	as originally filed
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2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the International application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the International application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB99/03072

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-20
	No: Claims
Inventive step (IS)	Yes: Claims 1-20
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-20
	No: Claims

2. Citations and explanations
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB99/03072

Ad V

Reference is made to the following document :

EP-0683199A (D1) deals with recycling of the fines left during the preparation of powder coatings (col. 1, lines 1-16 and col. 2, lines 13-16). It discloses a process in which a layer of waste powder is formed and subjected to heat up to coalescence of the powder but below decomposition or crosslinking (claim 1). It also discloses an apparatus for the treatment of the waste powder coating (claim 7). An even layer of waste powder is deposited on a moving conveyor belt by means of a vibrating plate and coalesced by heating using infrared lamps (example 1 and figure 2).

Art. 33(1)(2) PCT - Novelty

The present process claim 1 and apparatus claim 11 include the technical feature of depositing the fines on the conveyor means as a series of continuous lines. Because of this the subject-matter of claims 1-16 is considered to be novel (Art. 33(1)(2) PCT).

Art. 33(1) (3) PCT - Inventive step

For analysing inventive step, it has to be determined whether said distinguishing feature solves a technical problem in an unexpected manner. Both specifications pretend to be able to recycling the fines up to 100% (See D1, column 3, lines 35-40). Nevertheless, the applicant convincingly points out in his letter of reply that there may be reasons why the use of a vibrating plate leads to a less workable process for recycling fines. This means that the process in accordance with the present application is more reliable and more simple.

Since the presence of a vibrating plate does not allow to deliver the fines on the conveyor belt as a series of continuous lines, the skilled person would never arrive at the solution provided by the present specification.

The present application is therefore also based on an inventive step.

Hence, the requirements of Art. 33(1) PCT are met.

duration parameters were too low, no meaningful product could be produced, and if too high, the fines fused into solid block and hence, were unusable.

With reference to Table 1 below, the results of such experiments can be seen:

Duration	Temperature	% Product ¹
1 hour	70°C	58%
2 hours	70°C	83%

¹The % Product column indicates final yield of granular material once the semi-fused mass was crushed and screened through a 3.0 mm screen and then sieved on a 212 micron screen to remove any fines.

It was observed that the resulting grains were easy to handle and could be readily used as either a finished, non-colour specific, powder coating, that is, once the grains had been crushed to the correct particle size, or as a raw material for use in producing a new, colour specific, powder coating. With reference to the latter use, the resulting grains are preferably added at an addition level of around 5% to the new, colour specific, powder coating.

In light of our findings it is believed that in order to make the fines reusable and more manageable, it is essential to heat the fines to a point where they become tacky or semi-fused i.e. up to a point where the fines are not fully melted or cross-linked. If over-heated, the coating is fully cured and cannot be reused as a powder coating.

EP-0683198A discloses a process in which a layer of fines is formed on a conveyor belt and subjected to heat up to coalescence of the powder but below decomposition or cross-linking.

According to the present invention there is provided a process for recycling fines produced during the production of powder coatings comprising the steps of:
depositing the fines onto conveyor means as a series of continuous lines;
heating the lines of fines without fully melting or cross-linking them until they

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become sufficiently tacky to form agglomerated masses;

cooling such agglomerated masses; and

collecting the agglomerated mass.

The invention further provides a process plant for recycling fines in accordance with a process for recycling fines the process plant including:

means for transporting the fines to be recycled as a series of continuous lines into a heating area and then into a cooling area.

It is an object of the present invention to provide a recycling process that enables the fines produced during the production of powder coatings to be reused as a powder coating.

The process of the invention preferably comprises the step of passing the fines under a profiled comb or plate to form the continuous lines. The lines preferably have triangular profiles and preferably have a depth of 0.5 to 1.0 cm.

Further preferably, the fines are heated at a temperature of 60-80°C, preferably 70°C.

Further preferably the resulting particles have a size of 3 mm to 212 microns.

Further preferably, any particles having a size of less than 212 microns are removed from the resultant product.

One example of a recycling process will now be described with reference to a production trial that was carried out by us, and which is described herein below.

Production Trial

Several tons of fines were processed in a steam heated tray oven. The trays were lined with Melinex (RTM), which is a high melting point plastic film that will prevent

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adhesion or coating of the trays.

After a period of two hours, at a temperature of 70°C, it was observed that the mass on the trays had transformed into a crude honeycomb of product. This product was removed from the oven and allowed to cool on the trays.

The cooled mass was then removed from the trays and placed in a feed hopper to a crushing and screening plant. The particle size of the resulting grains produced was in the range of 8.00 mm to 212 microns.

The resulting grains were then reprocessed as a new raw material component in some test formulations at an inclusion rate of around 5%. The resulting test powder coatings were sprayed and baked in the normal QC process and found to be satisfactory.

Non-limiting embodiments of a processing plant in accordance with the present invention will now be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a schematic illustration of a first embodiment of a process plant in accordance with the present invention;

Figure 2 is a side elevation of the belt of the plant of Figure 1; and

Figure 3 is a schematic illustration of a second embodiment of a process plant in accordance with the present invention.

A first embodiment of a processing plant 10 in accordance with the present invention may include:

A) Fines Feed Hopper 11

The fines to be recycled were fed into a fines feed hopper 11. Preferably, the fines feed hopper 11 is designed so as to ensure that the fines

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adhesion or coating of the trays.

After a period of two hours, at a temperature of 70°C, it was observed that the mass on the trays had transformed into a crude honeycomb of product. This product was removed from the oven and allowed to cool on the trays.

The cooled mass was then removed from the trays and placed in a feed hopper to a crushing and screening plant. The particle size of the resulting grains produced was in the range of 3.00 mm to 212 microns.

The resulting grains were then reprocessed as a new raw material component in some test formulations at an inclusion rate of around 5%. The resulting test powder coatings were sprayed and baked in the normal QC process and found to be satisfactory.

Non-limiting embodiments of a processing plant in accordance with the present invention will now be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a schematic illustration of a first embodiment of a process plant in accordance with the present invention;

Figure 2 is a side elevation of the belt of the plat of Figure 1; and

Figure 3 is a schematic illustration of a second embodiment of a process plant in accordance with the present invention..

A first embodiment of a processing plant 10 in accordance with the present invention may include:

A) Fines Feed Hopper 11

The fines to be recycled were fed into a fines feed hopper 11. Preferably, the fines feed hopper 11 is designed so as to ensure that the fines

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curing apparatus which could achieve the partial cure profile as described herein.

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CLAIMS

1. A process for recycling fines produced during the production of powder coatings comprising the steps of:
depositing the fines onto conveyor means as a series of continuous lines;
heating the lines of fines without fully melting or cross-linking them until they become sufficiently tacky to form agglomerated masses;
cooling such agglomerated masses; and
collecting the agglomerated mass.
2. A process as claimed in claim 1, comprising passing the fines under a profiled comb or plate to form the continuous lines.
3. A process as claimed in claim 1 to 2, wherein the continuous lines of fines have triangular profiles.
4. A process as claimed in claim 1, 2 or 3, wherein the lines of fines have a depth of 0.5 to 1.0 cm.
5. A process as claimed in any one of claims 1 to 4, wherein heating is by means of at least one infra red lamp.

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6. A process as claimed in any one of claims 1 to 5, wherein the conveyor means is a moving belt running at a speed to give the fines an exposure time of 1 to 5 seconds.

7. A process as claimed in any one of claims 1 to 6, further comprising the step of processing the lines of agglomerated mass to produce particles of a desired particle size.

8. A process as claimed in any one of the preceding claims, wherein the fines are heated at a temperature of 60 to 80°C.

9. A process as claimed in claim 8, wherein the fines are heated at a temperature of 70°C.

10. A process as claimed in any one of the preceding claims, wherein after cooling, the cooled lines of agglomerated mass are crushed to produce particles of a desired particle size.

11. A process as claimed in claim 10, wherein the cooled lines of agglomerated mass are crushed to produce particles having a size of 3.00mm to 212 microns.

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12. A process as claimed in claim 11, wherein any crushed particles having a size of less than 212 microns are removed.

13. A process plant for recycling fines in accordance with a process for recycling fines as claimed in any one of the preceding claims, the process plant including:

means for transporting the fines to be recycled as a series of continuous lines into a heating area and then into a cooling area.

14. A process plant as claimed in claim 13 including a profiled comb or plate for forming the fines in continuous lines.

15. The process plant of claim 13 or 14, wherein the means for transporting the fines into a heating area and cooling area work continuously.

16. The process plant of claim 13, 14 or 15, wherein the means for transporting the fines into a heating area and then into a cooling area is a moving belt.

17. The process plant of any one of claims 13 to 16, wherein the heating area has heating means including at least one infra red lamp.

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18. The process plant of any one of claims 13 to 16, wherein the heating area has heating means including at least one ultra violet lamp.
19. The process plant of any one of claim 13 to 18, wherein the cooling area includes means for producing a cool stream of air.
20. The process plant of any one of claims 16 to 19 further comprising scraper means for cleaning the moving belt.

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